WATER RESOURCES REVIEW for NOVEMBER 1975

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

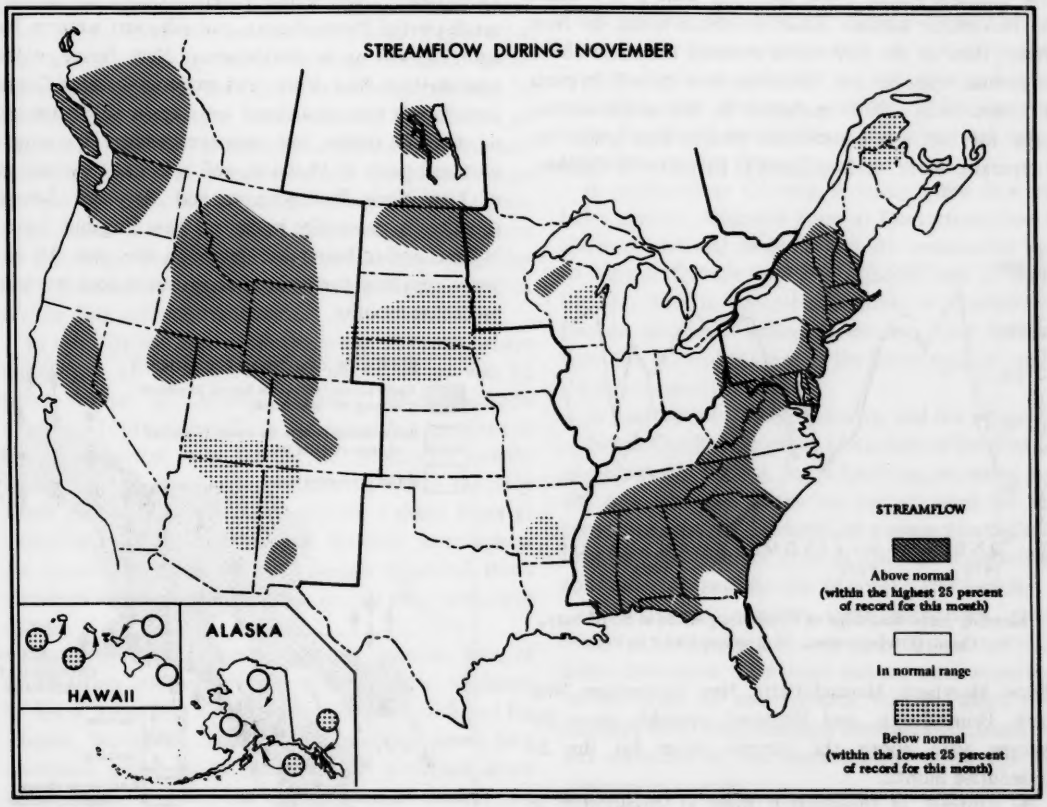
CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

STREAMFLOW AND GROUND—WATER CONDITIONS

Streamflow generally increased in southern Canada and in many northwestern, central, and western States, and Hawaii, but decreased in Alaska, and in parts of some southeastern and west-central States.

Flows remained above normal in large areas in eastern and northwestern United States and in smaller areas in central Canada. Below-normal flows persisted in some north-central and southwestern States, and parts of eastern Canada.

Monthly and daily mean discharges were highest of record and some flooding occurred on Vancouver Island, British Columbia.

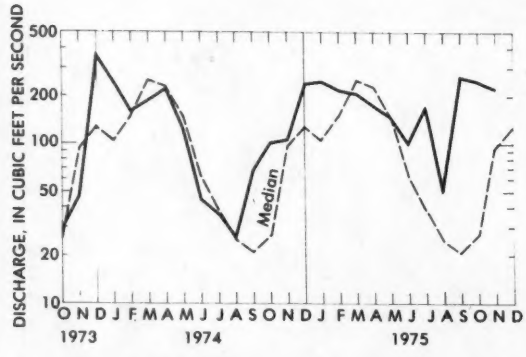


NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW GENERALLY INCREASED EXCEPT IN PARTS OF CONNECTICUT, MARYLAND, NEW JERSEY, NEW YORK, AND PENNSYLVANIA, WHERE MONTHLY MEAN FLOWS DECREASED CONTRASEASONALLY FROM THE ABNORMALLY HIGH DISCHARGES OF OCTOBER. ABOVE-NORMAL FLOWS PERSISTED IN THE CENTRAL AND SOUTHERN PARTS OF THE REGION AND BELOW-NORMAL FLOWS PERSISTED IN PARTS OF NEW BRUNSWICK AND QUEBEC.

Moderate runoff from seasonal rains, augmented by high carryover flows from October, held monthly mean discharges above the normal range in parts of Quebec, Maryland, New Jersey, New York, Pennsylvania, and the New England States. Flows generally were 2 to 3 times the November median flows in those areas. In New Jersey, flow at the two index stations remained above the normal range for the 7th consecutive month. In parts of Connecticut, flow remained in the above-normal range for the 5th consecutive month (see graph for Pomperaug River at Southbury). In parts of Quebec,



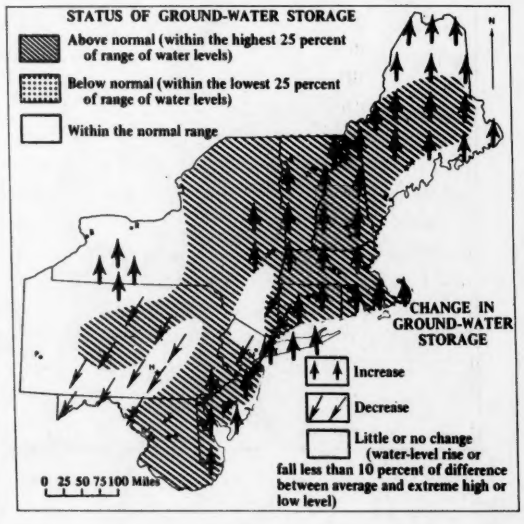
Monthly mean discharge of Pomperaug River at Southbury, Conn. (Drainage area, 75.0 sq mi; 194.2 sq km)

Maine, Maryland, Massachusetts, New Hampshire, New York, Pennsylvania, and Vermont, monthly mean discharges were above the normal range for the 3d consecutive month.

By contrast, in Upsalquitch River at Upsalquitch, in northern New Brunswick, and in Matane River near Matane, in the adjacent area of eastern Quebec, low carryover flow from October, coupled with only minor seasonal increases in flow during November, held monthly mean discharges in the below-normal range.

In the Potomac River basin, in the southern part of the region, the daily mean discharge of 66,100 cfs on October 20, at the index station, Potomac River near Washington, D.C., was highest for that month since records began in 1930 and the October monthly mean flow was more than 6 times median. Flow decreased contraseasonally at that index station in November but remained in the above-normal range for the 3d consecutive month. In Maryland, monthly mean discharges at the index stations, Seneca Creek at Dawsonville, and Choptank River near Greensboro, continued to decrease from the abnormally high flows of September (associated with tropical storm Eloise), and were 3 times the median flow for November. Cumulative runoff for the 3-month period, September through November, was about 5 times normal at those two sites.

Ground-water levels continued to rise in most of New England and in east-central New York, southern New Jersey, and in Delaware (see map). Levels also rose on Long Island, New York. Levels declined in central and south-central Pennsylvania, and adjacent western Maryland, as well as in northeastern New Jersey, extreme southeastern New York, and extreme western Connecticut. Levels near monthend were again above average in most of the region, but were near average in coastal and northern parts of Maine as well as in some western parts of New York, Pennsylvania, and Maryland. Levels in some wells, especially in central New England, were the highest end-of-November levels in the past 20 to 30 years, resulting partly from carryover of high levels from preceding months.



Map shows ground-water storage near end of November and change in ground-water storage from end of October to end of November.

SOUTHEAST

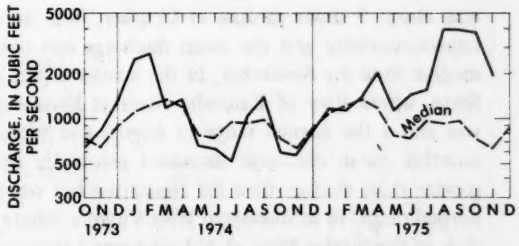
[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW GENERALLY DECREASED EXCEPT IN NORTH CAROLINA AND VIRGINIA WHERE SEASONAL INCREASES WERE PREVALENT. FLOWS REMAINED ABOVE THE NORMAL RANGE IN PARTS OF ALL STATES OF THE REGION FOR THE THIRD CONSECUTIVE MONTH. MONTHLY MEAN DISCHARGES WERE 5 TO 12 TIMES MEDIAN IN PARTS OF ALABAMA AND MISSISSIPPI.

In central Mississippi, where flow during October at the index station, Big Black River near Bovina, was 26 times median and highest of record for the month, mean discharge during November decreased contraseasonally and was 12 times the median flow. In the southeastern part of the State, where mean discharge of Pascagoula River at Merrill in October also was highest of record for that month, monthly mean discharge remained above the normal range for the 7th consecutive month. Also in southeastern Mississippi, mean flow in Pearl River, as measured near the Mississippi-Louisiana border, near Bogalusa, Louisiana, remained above the normal range for the 7th consecutive month. In northeastern Mississippi, mean flow at the index station, Tombigbee River at Columbus, remained in the above-normal range for the 4th consecutive month and was greater than median for the 20th consecutive month.

In the adjacent area of northwestern Alabama, where mean flow of Tombigbee River near Coatopa was 12 times median in October, monthly mean discharge decreased contraseasonally in November but remained in the above-normal range for the 6th consecutive month. In central and southeastern Alabama, where monthly mean discharge at the index stations Cahaba River at Centreville and Conecuh River at Brantley, were highest for October in their respective periods of record, flows remained above the normal range for the 6th consecutive month.

In northwestern Florida, and the adjacent area of southeastern Alabama, where monthly mean discharge of Shoal River near Crestview, was highest of record for August, September, and October, monthly mean flow decreased seasonally in November but remained above the normal range for the 8th consecutive month (see graph). Also in the northern part of the State, the discharge of Silver Springs increased 20 cfs, to 690 cfs; 81 percent of normal. In west-central Florida, flow of Peace River decreased seasonally but monthly mean discharge was nearly twice the November median flow



Monthly mean discharge of Shoal River near Crestview, Fla. (Drainage area, 474 sq mi; 1,228 sq km)

and was above the normal range. In the southeastern part of the State, flow of Miami Canal at Miami remained at 250 cfs; 74 percent of normal. In southwestern Florida, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, decreased 903 cfs, to 95 cfs; 44 percent of normal.

In Tennessee, where monthly mean discharges in October were highest of record for the month at all index stations, high carryover flows held monthly mean flows in the above-normal range. At the index station, Emory River at Oakdale in east-central Tennessee, monthly mean discharge remained above the normal range for the 3d consecutive month and was 5 times the November median flow.

In northeastern Georgia, monthly mean flow at the index station, Altamaha River at Doctortown, remained above the normal range for the 9th consecutive month. In western Georgia, and the adjacent area of northern Florida, flow in Apalachicola River at Chattahoochee, Florida, decreased seasonally but was twice the median flow for November, and in the above-normal range for the 6th consecutive month.

In northeastern South Carolina, and the adjacent area of North Carolina, monthly mean flow of Pee Dee River, as measured at Peedee, South Carolina, decreased seasonally and remained above the normal range for the 3d consecutive month. Similarly, in western North Carolina, flow of French Broad River at Asheville remained in the above-normal range for the 3d consecutive month.

In Virginia, monthly mean discharges generally increased seasonally and were above the normal range at index stations in the eastern and extreme western parts of the State. In north-central Virginia, mean flow of Rapidan River near Culpeper decreased contraseasonally but remained in the above-normal range for the 3d consecutive month.

In northern and eastern parts of West Virginia, monthly mean flows decreased contraseasonally at the index stations but remained above the normal range for the 3d consecutive month. In the extreme northern part of the State, where flow of Potomac River at Paw Paw

was about 9 times median in October, flow decreased contraseasonally and the mean discharge was twice the median flow for November. In the southern part of the State, where flow of Kanawha River at Kanawha Falls was above the normal range in August and September, monthly mean discharge increased seasonally and was greater than median flow for November but was in the normal range. In southeastern West Virginia, where mean flow of Greenbrier River at Alderson was 5 times median in October, flow decreased slightly in November but the monthly mean discharge was twice the median for the month.

Ground-water levels generally rose in West Virginia (except for declines in northeastern panhandle and in northwest), in Kentucky, and in the mountain areas of western North Carolina. Levels fell in the Piedmont and Coastal Plain parts of North Carolina, in the Piedmont of Georgia, and in the northern and southeastern parts of Florida. In heavily pumped areas of coastal Georgia, levels generally rose in the Savannah area and declined in the Brunswick area. Monthend levels were above average in most of Kentucky, West Virginia, and North Carolina, and in the Piedmont of Georgia. Monthend levels were near or below average in southeastern Florida.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW GENERALLY INCREASED SEASONALLY EXCEPT IN PARTS OF OHIO, INDIANA, AND MINNESOTA. FLOWS REMAINED IN THE ABOVE-NORMAL RANGE IN EASTERN OHIO, AND INCREASED INTO THAT RANGE IN NORTHWESTERN MINNESOTA AND WEST-CENTRAL WISCONSIN. STREAMFLOWS REMAINED BELOW THE NORMAL RANGE IN SOUTHWESTERN MINNESOTA.

In southwestern Minnesota, flow of Minnesota River at the index station near Jordan increased contraseasonally but remained below the normal range and was about 50 percent of median for the 4th consecutive month. To the northwest, monthly mean discharge at Buffalo River near Dilworth, was 173 percent of median and above the normal range. Flows in the remainder of the State increased and were in the normal range.

In Michigan, streamflow increased seasonally and was in the normal range. In the Lower Peninsula, where flow at the index station, Muskegon River at Evart, was above the normal range from June through October, monthly mean flow increased seasonally but returned to the normal range.

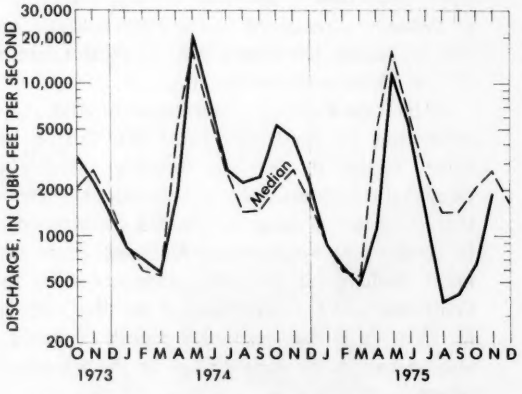
In Ohio, flows decreased from the unusually high monthly mean discharges of October. Streamflow was above the normal range in the eastern portion of the State and in the normal range for the remainder of Ohio.

In eastern Indiana, monthly mean discharge at the index station, Mississinewa River at Marion, decreased contraseasonally but was in the normal range. Elsewhere in the State, flows increased and were slightly above median.

Flows in Illinois increased seasonally except at the index station, Sangamon River at Monticello, where monthly mean discharge decreased into the normal range. All index stations in the State reported flows at or slightly above median.

Streamflow was in the above-normal range in northwestern Wisconsin and near median in the remainder of the State. In central Wisconsin, the monthly mean discharge of 2,010 cfs in Fox River at Rapide Croche Dam near Wrightstown (drainage area, 6,150 square miles) was 71 percent of median and below the normal range.

In east-central Ontario, flow of Missinaibi River at Mattice increased seasonally and was in the normal range following a period of 4 months in the below-normal range (see graph). Elsewhere in Ontario, flows were in the normal range and generally increased seasonally.



Monthly mean discharge of Missinaibi River at Mattice, Ontario (Drainage area, 3,450 sq mi; 8,936 sq km)

Ground-water levels declined in most of the region. One exception was the rising level in the observation well near Ishpeming in the western part of Michigan's Upper Peninsula. Monthend levels were generally below average in Minnesota; near or above average in Michigan; and above average in northeastern Ohio. In the heavily pumped Minneapolis-St. Paul, Minn., area, levels continued to rise in the artesian aquifers but remained below average. In Wisconsin, levels in the deep sandstone aquifer continued to decline and were below average.

MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW GENERALLY INCREASED IN ALL PARTS OF THE REGION BUT DECREASED AT SOME INDEX STATIONS IN LOUISIANA, MISSOURI, AND TEXAS. MONTHLY MEAN FLOWS REMAINED ABOVE THE NORMAL RANGE IN PARTS OF LOUISIANA, MANITOBA, AND NORTH DAKOTA, AND BELOW THAT RANGE IN PARTS OF NEBRASKA AND SOUTH DAKOTA.

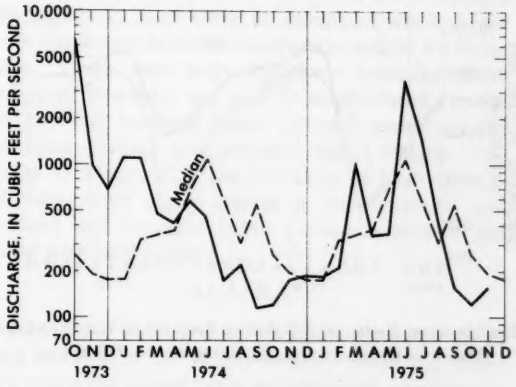
High carryover flow from October in the upper reaches of Pearl River basin (in southern Mississippi), augmented by runoff from November rains, held monthly mean discharge at the index station, Pearl River near Bogalusa, in southeastern Louisiana, in the above-normal range for the 7th consecutive month.

In southern Arkansas, the normal seasonal increase in flow in Saline River basin did not occur in November and the monthly mean discharge at the index station near Rye was only one third of median and was below the normal range. In the northern part of the State, the small seasonal increase in flow of Buffalo River at the index station near St. Joe also was less than normal and the monthly mean discharge was only about one third of median flow.

In western Texas, monthly mean flows increased and were above the normal range in the South Concho River and San Saba River basins. In the northern part of the State, flows were in the below-normal range in the upper Sabine and Trinity River basins, the middle Brazos River basin, and the Red River and Sulphur River basins. Elsewhere in the State, flows were in the normal range.

In south-central Kansas, where monthly mean discharge of Arkansas River at Arkansas City was only one fourth of median and in the below-normal range in October, flow increased seasonally in November and was in the normal range but less than the median for the month. In north-central Kansas and the adjacent area of Nebraska, where flow during October in Little Blue River, as measured near Barnes, Kansas, was only one half of median and below the normal range, monthly mean discharge increased contraseasonally as a result of increased runoff early in November and was in the normal range (see graph).

In Iowa and northern Missouri, flows generally increased and remained near or slightly below median. In southern Missouri, monthly mean discharge of Gasconade River at Jerome decreased seasonally but remained above median for November.



Monthly mean discharge of Little Blue River near Barnes, Kansas (Drainage area, 3,324 sq mi; 8,609 sq km)

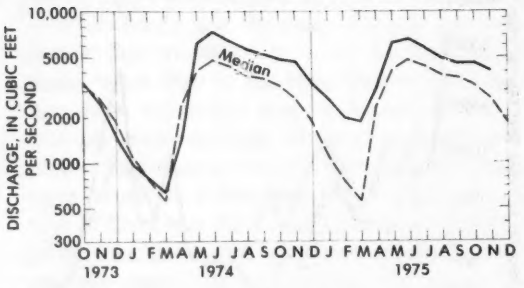
In northern Nebraska, flows at the index stations, Niobrara River above Box Butte Reservoir and Elkhorn River at Waterloo, increased seasonally but were below the normal range. Monthly mean discharge at Waterloo has been in the below-normal range for 4 consecutive months.

In Big Sioux River basin in eastern South Dakota and the adjacent areas of Minnesota and Iowa, monthly mean flow, as measured at Akron, Iowa, remained in the below-normal range and was only one half of median. In the central part of South Dakota, flow did not occur at the index station, Bad River near Fort Pierre, during the entire month.

In eastern North Dakota, high carryover flow from October held monthly mean discharge of Red River of the North at Grand Forks in the above-normal range for the 12th time in the past 13 months. Flows increased, and were above the normal range in many streams across the northern half of the State as a result of runoff from rain and snowmelt at and subsequent to midmonth.

In south-central Manitoba, monthly mean discharge of Waterhen River below Waterhen Lake remained the same as in October and was above the normal range for the 17th time in the past 19 months (see graph on page 6). Also in the south-central part of the Province, the level of Lake Winnipeg averaged 715.77 feet above mean sea level, 2.41 feet higher than the November long-term mean, 0.14 foot lower than last month, and 0.23 foot lower than last year.

Ground-water levels generally rose in North Dakota (except in southwestern part), Iowa, and Nebraska; declined slightly in Kansas; and were unchanged or changed very little in northern Louisiana. In southeastern Louisiana, levels rose in the immediate Baton Rouge industrial area, but declined in outlying areas of the same aquifers. In the rice-growing area of east-central



Monthly mean discharge of Waterhen River below Waterhen Lake, Manitoba (Drainage area, 22,000 sq mi; 56,980 sq km)

Arkansas, the level was unchanged in the shallow aquifer; whereas the usual winter rise (following cessation of irrigation) continued in the deep aquifer (Sparta Sand). In central Arkansas, the level rose in the observation well at Pine Bluff. In Iowa and Nebraska, levels near monthend were near or below average. In Texas, levels rose in the Evangeline aquifer at Houston and in the Edwards Limestone at San Antonio; and declined in the Edwards Limestone at Austin and in the bolson deposits at El Paso. Monthend levels were above average at Austin and San Antonio; and below average at Houston (lowest of record for November) and El Paso (alltime low).

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW GENERALLY INCREASED EXCEPT IN MONTANA, NEW MEXICO, AND UTAH, WHERE DECREASING FLOWS WERE PREVALENT. FLOWS REMAINED ABOVE THE NORMAL RANGE IN A LARGE AREA IN THE WESTERN AND NORTH-CENTRAL PART OF THE REGION AND IN SMALLER AREAS IN BRITISH COLUMBIA, AND REMAINED BELOW THAT RANGE IN AN AREA CENTERED ON NORTHEASTERN ARIZONA. RECORD-HIGH MONTHLY AND DAILY MEAN DISCHARGES, AND MODERATE FLOODING, OCCURRED ON VANCOUVER ISLAND.

In the southeastern-coastal part of Vancouver Island, in western British Columbia, the monthly mean discharge of 6,210 cfs, and the daily mean discharge of 10,200 cfs on November 5, in Sproat River near Alberni (drainage area, 134 square miles), were highest for the month in 51 years of record. The previous November maximum monthly and daily means were 4,330 cfs and 8,730 cfs, respectively, which occurred in 1939. Flooding was reported at Port Alice, in the northern part of the Island. In the west-central part of British Columbia, monthly mean flow at the index station, Skeena River at Usk, decreased seasonally and remained below the normal range.

In the adjacent State of Washington, flows increased seasonally at all index stations. In the western part of the State, monthly mean discharges of Chehalis River near Grand Mound and Skykomish River near Gold Bar increased sharply and were above the normal range. In the Columbia River basin, in western Washington and the adjacent areas of Idaho and Oregon, monthly mean discharge of Columbia River at The Dalles, Oregon, increased seasonally and remained above the normal range for the 3d consecutive month.

In Idaho and Montana, high carryover flows from October, augmented by runoff from above-normal precipitation in some stream basins, held monthly mean discharges at many index stations in the above-normal range. In northern and eastern Idaho, flows in Kootenai, Clearwater, Salmon, Boise, and Snake Rivers were above the normal range. Flows of Salmon River at White Bird and Snake River near Heise have been in the above-normal range for the past 6 months.

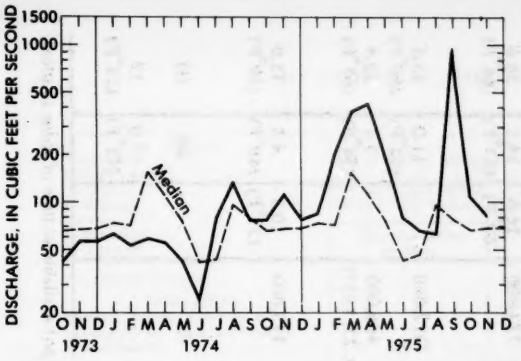
In Montana, flows were above the normal range at all index stations except Marias River near Shelby, in the northwest part of the State and east of the Continental Divide. Monthly mean discharge in Clark Fork at St. Regis, west of the Divide, increased seasonally and remained above the normal range for the 6th consecutive month.

In Wyoming, monthly mean discharge was above the normal range in all parts of the State except the southeast, where flow of Niobrara River was below normal.

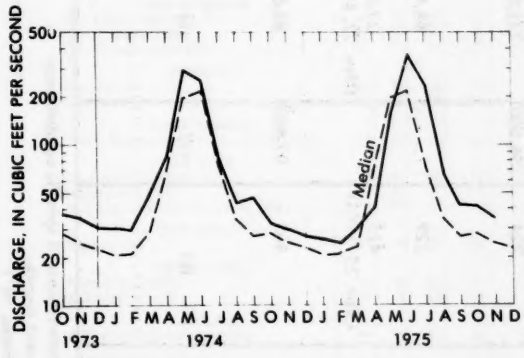
In Colorado, monthly mean flows increased except in the Animas River basin, in the southwestern part of the State, where flow at Durango decreased seasonally and was below the normal range. In the San Juan River basin, in the adjacent areas of Arizona, New Mexico, and Utah, monthly mean flow near Bluff, Utah, also decreased seasonally and remained below the normal range.

In southeastern Arizona, monthly mean discharges generally increased but remained in the below-normal range. In the adjacent area of southwestern New Mexico, flow of Gila River near Gila decreased but remained above the normal range for the 3d consecutive month (see graph). In northwestern Arizona, there has been no flow in Little Colorado River near Cameron since October 8.

In northern Utah, flow of Big Cottonwood Creek near Salt Lake City decreased into the normal range but



Monthly mean discharge of Gila River near Gila, N. Mex. (Drainage area, 1,864 sq mi; 4,828 sq km)



Monthly mean discharge of Big Cottonwood Creek near Salt Lake City, Utah (Drainage area, 48.5 sq mi; 126 sq km)

remained above median for the 6th consecutive month (see graph), and monthly mean discharge of Weber River near Oakley continued to decrease seasonally but remained above the normal range for the 6th consecutive month. Also in northern Utah, the level of Great Salt Lake rose 0.20 foot during the month (to 4,200.25 feet above mean sea level), 0.90 foot higher than the average level for November.

Storage in most major reservoirs was above average at monthend. The net decrease in storage in the Colorado River Storage Project was 97,610 acre-feet during the month.

Ground-water levels generally declined in Montana and also in southwestern Idaho in the Boise Valley (sand and gravel aquifer). In southern Arizona, levels rose or changed only slightly. Levels rose also in Utah and in north-central Nevada. In New Mexico, levels changed only slightly in most wells; an exception was a 3-foot rise in the Berrendo-Smith observation well in the Pecos Valley. Levels near monthend were generally above average in Montana, and also in north-central Nevada and parts of northern Idaho (alluvial aquifer of the Rathdrum Prairie) and southern Idaho (Snake Plain aquifer at Atomic City and Gooding). In Utah, monthend levels were above average in the northeast and southeast and remained below average in western and central parts of the State.

ALASKA

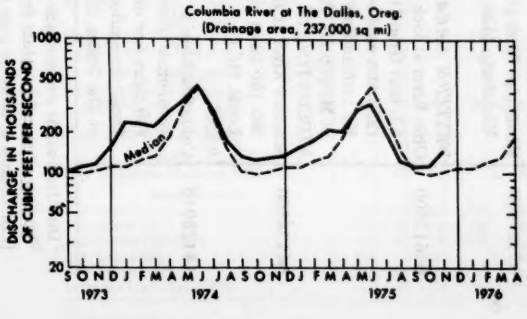
Streamflow continued to decrease seasonally at all index stations in the State, Monthly mean discharges were below the normal range in Gold Creek near Juneau, in southeastern Alaska, where precipitation was only about one half of normal for the month, and in Kenai River at Cooper Landing, in the south-coastal area, where below-normal temperatures early in the month caused a sharp recession in flow. In the east-central part of the State, monthly mean flow of Tanana River at Nenana (drainage area, 25,600 square miles) decreased seasonally but remained above the normal range for the 3d consecutive month, and the daily discharge of 14,000 cfs on November 1 was highest for the month since records began in 1963.

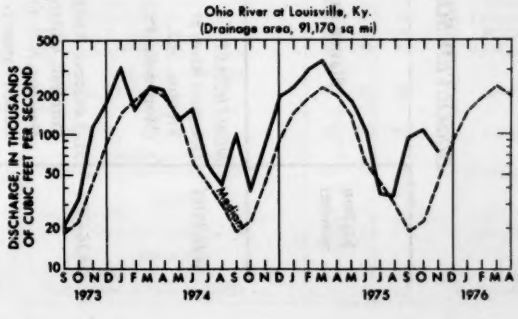
Ground-water levels in water-table and confined aquifers in the Anchorage area changed only slightly, except near centers of heavy pumpage in the confined aquifers. There was also little change in levels in the Kenai area.

HAWAII

Streamflow generally increased, as a result of runoff from rains in the 2d half of the month, but was below the normal range at index stations on the islands of Kauai and Oahu. The monthly mean discharge of 1.20 cfs in Kalihi Stream near Honolulu (drainage area, 2.61 square miles) in southeastern Oahu, was only 24 percent of median. Flows increased seasonally on the islands of Hawaii and Maui, and remained in the normal range. Moderate increases in flow occurred at monthend near Hilo, on the eastern shore of the island of Hawaii, as a result of runoff from rains associated with the earthquakes and volcanic eruptions at that time.

HYDROGRAPHS OF TWO LARGE RIVERS





DISSOLVED SOLIDS AND WATER TEMPERATURES FOR NOVEMBER AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	November data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a]			Water temperature during month		
			Mean (cfs)	Minimum (mg/l)	Maximum (mg/l)	Mean	Minimum	Maximum	Mean, in °C	Minimum, in °C	Maximum, in °C
						(tons per day)					
	NORTHEAST										
01463500	Delaware River at Trenton, N.J.	1975	17,190	81	106	4,220	2,740	7,920	11.0 (52°F)	6.5 (44°F)	15.5 (60°F)
	(Morrisville, Pa.)	1944–73	10,094	55 (Nov. 1–10, 1955)	151 (Nov. 15, 1964)	.....	469 (Nov. 6, 1963)	10,100 (Nov. 27–30, 1950)	.....	2.2 (36°F)	18.9 (66°F)
		[1940–69	9,024[b]]								
04264331	St. Lawrence River at Cornwall, Ontario, near	1975	287,400	167	167	130,000	126,000	132,000	10.5 (51°F)	8.0 (46°F)	12.0 (54°F)
	Massena, N.Y. (streamflow station formerly at	1966–73	261,200	.....	.....	.....	.....	.....	.....	5.0 (41°F)	14.5 (58°F)
	Ogdensburg, N.Y.)	[1940–69	228,000[b]]								
	SOUTHEAST										
07289000	Mississippi River at Vicksburg, Miss	1975	430,400	204	224	256,000	221,000	322,000	16.5 (62°F)	14.1 (57°F)	18.0 (64°F)
		[1940–69	291,300[b]]								
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam 53, near Grand Chain, Ill.	1975	213,200	185	229	.....	68,400	212,000	.....	11.0 (52°F)	15.5 (60°F)
	(25 miles west of Paducah, Ky.; streamflow station	1954–69, 1972–73	153,300	129 (Nov. 21, 1957)	425 (Nov. 25, 1968)	.....	27,200 (Nov. 22, 1954)	406,000 (Nov. 23, 1957)	.....	1.1 (34°F)	19.4 (67°F)
	at Metropolis, Ill.)	[1940–69	120,800[b]]								
	MIDCONTINENT										
06934500	Missouri River at Hermann, Mo. (60 miles west of St. Louis, Mo.)	1975	80,600	418	465	97,400	88,600	115,000	10.5 (51°F)	4.5 (40°F)	15.0 (59°F)
		[1940–69	43,700[b]]								
	WEST										
14128910	Columbia River at Warrendale, Oreg.	1975	139,800	(c)	(c)	(c)	(c)	(c)	.....	(c)	(c)
	(30 miles east of Portland, Oreg.; streamflow station	1967–73	122,600	.....	.....	.....	.....	.....	.....	7.0 (45°F)	13 (55°F)
	at The Dalles, Oreg.)	[1940–69	106,500[b]]								

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.

[b]Median of monthly values for 30-year reference period, for comparison with data for current month.

[c]Data not available at time of going to press.

[Corrections in table on page 8 of October issue: St. Lawrence River, October 1975, minimum, 54°F
Mississippi River, October 1975, minimum, 64°F; maximum, 74°F]

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF NOVEMBER 1975

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Oct. 1975	End of Nov. 1975	End of Nov. 1974	Average for end of Nov.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	28	28	47	.....	223,400 (a)
QUEBEC					
Allard (P)	90	93	66	59	280,600 ac-ft
Gouin (P)	82	84	94	65	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	52	56	48	55	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	68	51	69	77	3,330 mcf
Lake Francis (FPR)	92	92	80	78	4,326 mcf
Lake Winnipesaukee (PR)	82	87	71	24	7,200 mcf
VERMONT					
Harriman (P)	79	73	44	79	5,060 mcf
Somerset (P)	92	89	73	129	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	82	80	72	72	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	79	63	60	55	34,270 mcf
Indian Lake (FMP)	97	82	87	58	4,500 mcf
New York City reservoir system (MW)	96	96	83	.....	547,500 mg
NEW JERSEY					
Wanaque (M)	101	100	59	66	27,730 mg
PENNSYLVANIA					
Pymatuning (FMR)	95	92	93	77	8,191 mcf
Wallenpaupack (P)	72	74	63	49	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	99	100	89	83	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	98	93	79	75	12,580 mcf
Narrows (Badin Lake) (P)	97	97	94	92	5,617 mcf
High Rock Lake (P)	91	72	37	55	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	78	67	74	56	70,300 mcf
Lakes Marion and Moultrie (P)	75	76	86	60	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	74	70	55	48	75,360 mcf
GEORGIA					
Burton (PR)	84	77	77	53	104,000 ac-ft
Sinclair (MPR)	86	73	75	68	214,000 ac-ft
Lake Sidney Lanier (FMPR)	64	63	44	46	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	87	79	78	57	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	33	33	27	29	1,156,000 cfsd
Douglas Lake (FPR)	39	27	26	15	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	56	50	40	40	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	44	42	44	32	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	48	47	35	39	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	76	93	89	74	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	47	60	62	63	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	28	23	31	28	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	94	92	91	.....	22,640,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	59	61	63	74	127,600 ac-ft
Bell Fourche (I)	25	36	31	40	185,200 ac-ft
Lake Francis Case (FIP)	61	51	54	49	4,834,000 ac-ft
Lake Oahe (FIP)	88	81	80	.....	22,530,000 ac-ft
Lake Sharpe (FIP)	102	101	101	90	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	97	95	95	91	477,000 ac-ft
MIDCONTINENT REGION—Continued					
NEBRASKA					
Lake McConaughy (IP)	70	73	74	68	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	82	78	123	90	2,378,000 ac-ft
Keystone (FPR)	75	74	161	101	661,000 ac-ft
Tenkiller Ferry (FPR)	99	96	148	99	628,200 ac-ft
Lake Altus (FIMR)	87	90	41	46	134,500 ac-ft
Lake O'The Cherokees (FPR)	75	72	112	81	1,492,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	94	92	107	92	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	92	90	58	42	386,400 ac-ft
Canyon (FMR)	90	92	99	62	385,600 ac-ft
International Amistad (FIMPW)	100	100	100	67	3,497,000 ac-ft
International Falcon (FIMPW)	93	98	100	74	2,667,000 ac-ft
Livingston (IMW)	100	98	100	65	1,788,000 ac-ft
Possum Kingdom (IMPRW)	93	93	75	101	569,400 ac-ft
Red Bluff (PI)	36	36	51	28	307,000 ac-ft
Toledo Bend (P)	85	85	100	72	4,472,000 ac-ft
Twin Buttes (FIM)	94	97	100	94	177,800 ac-ft
Lake Kemp (IMW)	83	84	63	90	268,000 ac-ft
Lake Meredith (FMW)	46	45	49	37	821,300 ac-ft
Lake Travis (FIMPRW)	91	92	100	75	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	96	89	90	77	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	93	93	98	96	5,232,000 ac-ft
Lake Chelan (PR)	76	77	63	64	676,100 ac-ft
Lake Cushman	101	98	76	84	359,500 ac-ft
Lake Merwin (P)	101	105	100	89	246,000 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	57	61	57	53	1,235,000 ac-ft
Coeur d'Alene Lake (P)	62	49	40	55	238,500 ac-ft
Pend Oreille Lake (FP)	62	40	32	54	1,561,000 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (MP)	62	67	65	57	4,282,000 ac-ft
WYOMING					
Boysen (FIP)	88	87	85	79	802,000 ac-ft
Buffalo Bill (IP)	67	69	67	72	421,300 ac-ft
Keyhole (F)	68	67	69	38	199,900 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	60	61	61	43	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	13	364,400 ac-ft
Taylor Park (IR)	79	67	55	52	106,200 ac-ft
Colorado–Big Thompson project (I)	71	71	69	56	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	82	80	72	.....	31,280,000 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	81	78	79	56	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	72	65	65	50	1,000,000 ac-ft
Hetch Hetchy (MP)	66	60	52	40	360,400 ac-ft
Isabella (FIR)	31	31	41	20	551,800 ac-ft
Pine Flat (FI)	39	44	47	38	1,014,000 ac-ft
Clair Engle Lake (Lewiston) (P)	80	76	75	73	2,438,000 ac-ft
Lake Almanor (P)	88	81	83	45	1,036,000 ac-ft
Lake Berryessa (FIMW)	86	85	86	75	1,600,000 ac-ft
Millerton Lake (FI)	34	48	38	38	503,200 ac-ft
Shasta Lake (FIPR)	80	77	77	65	4,377,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	78	74	68	47	744,600 ac-ft
NEVADA					
Rye Patch (I)	81	83	60	.....	157,200 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	77	77	75	67	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	12	13	26	12	1,093,000 ac-ft
Salt and Verde River system (IMPR)	50	50	51	33	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	23	23	37	77	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	21	24	16	25	2,539,000 ac-ft

[a]Thousands of kilowatt-hours

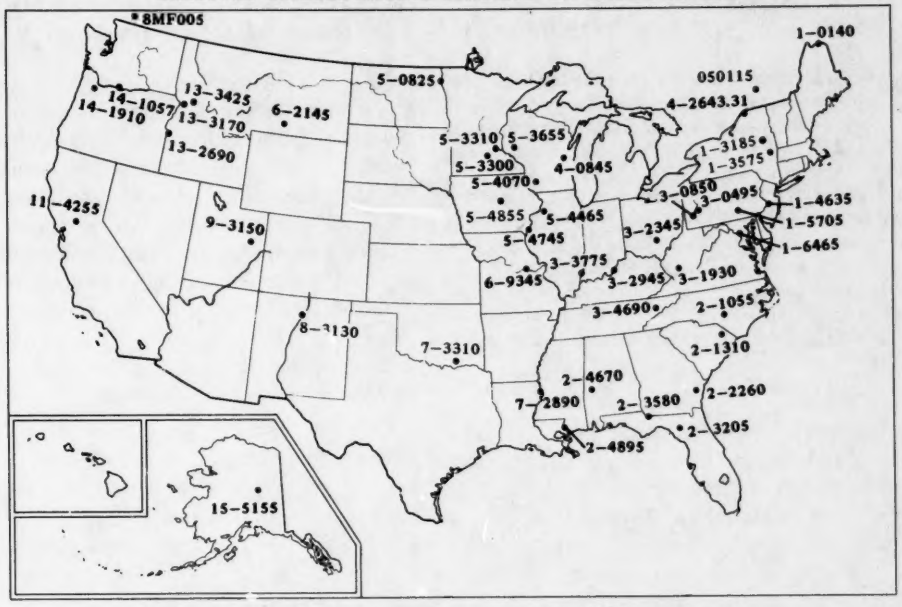
Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING NOVEMBER 1975

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	November 1975					
				Monthly discharge (cfs)	Percent of median monthly discharge, 1941–70	Change in discharge from previous month (percent)	Discharge near end of month		
							(cfs)	(mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	6,690	95	+36	4,300	2,800	30
1–3185	Hudson River at Hadley, N.Y	1,664	2,791	4,350	218	+16	3,500	2,300	30
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,450	7,610	204	-4	.....	.....	....
1–4635	Delaware River at Trenton, N.J	6,780	11,360	17,190	190	-5	16,500	10,700	30
1–5705	Susquehanna River at Harrisburg, Pa.	24,100	33,670	35,410	168	-43	30,700	19,800	30
1–6465	Potomac River near Washington, D.C.	11,560	[1] 10,640	11,690	281	-35	7,890	5,100	30
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	4,847	3,380	145	0	2,900	1,900	30
2–1310	Pee Dee River at Peedee, S.C	8,830	9,098	8,320	185	-19	8,250	5,300	26
2–2260	Altamaha River at Doctortown, Ga.	13,600	13,380	9,918	212	-25	11,300	7,300	25
2–3205	Suwannee River at Branford, Fla	7,740	6,775	4,010	93	-26	3,480	2,250	30
2–3580	Apalachicola River at Chattahoochee, Fla.	17,200	21,690	22,200	200	-23	15,700	10,100	30
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala.	15,400	21,700	13,260	229	-59	14,500	9,400	25
2–4895	Pearl River near Bogalusa, La	6,630	8,533	8,700	190	-14	3,640	2,350	30
3–0495	Allegheny River at Natrona, Pa	11,410	[1] 18,700	14,520	139	-30	10,700	6,900	28
3–0850	Monongahela River at Braddock, Pa.	7,337	[1] 11,950	9,765	152	-2	5,400	3,500	28
3–1930	Kanawha River at Kanawha Falls, W.Va.	8,367	12,370	9,523	144	+4	6,000	3,900	29
3–2345	Scioto River at Higby, Ohio	5,131	4,337	1,864	165	-36	2,000	1,300	25
3–2945	Ohio River at Louisville, Ky[2]	91,170	110,600	74,000	167	-31	66,700	43,100	24
3–3775	Wabash River at Mount Carmel, Ill.	28,600	26,310	10,420	139	+23	8,220	5,300	30
3–4690	French Broad River below Douglas Dam, Tenn.	4,543	[1] 6,528	6,173	176	+5	.....	.....	....
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis.[2]	6,150	4,142	2,010	71	-16	.....	.....	....
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y.[3]	299,000	239,100	287,000	126	-1	284,000	184,000	30
050115	St. Maurice River at Grand Mere, Quebec.	16,300	24,900	17,200	83	+1	22,700	14,700	26
5–0825	Red River of the North at Grand Forks N. Dak.	30,100	2,439	2,297	202	+4	2,000	1,300	30
5–3300	Minnesota River near Jordan, Minn ..	16,200	3,306	474	57	+15	450	290	28
5–3310	Mississippi River at St. Paul, Minn ...	36,800	[1] 10,230	6,624	122	+20	5,620	3,630	27
5–3655	Chippewa River at Chippewa Falls, Wis.	5,600	5,062	7,900	224	+262	.....	.....	....
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,457	7,611	128	+47	.....	.....	....
5–4465	Rock River near Joslin, Ill	9,520	5,288	3,350	117	+25	3,160	2,040	30
5–4745	Mississippi River at Keokuk, Iowa ...	119,000	61,210	46,470	128	+55	50,900	32,900	30
5–4855	Des Moines River below Raccoon River at Des Moines, Iowa.	9,879	3,796	531	61	+40	710	460	30
6–2145	Yellowstone River at Billings, Mont.	11,795	6,754	4,894	136	-6	4,800	3,100	30
6–9345	Missouri River at Hermann, Mo	528,200	78,480	78,560	180	-1	79,100	51,100	24
7–2890	Mississippi River near Vicksburg, Miss.[4]	1,144,500	552,700	430,400	148	-2	415,000	268,000	30
7–3310	Washita River near Durwood, Okla ..	7,202	1,379	589	132	+16	650	420	30
8–3130	Rio Grande at Otowi Bridge, near San Ildefonso, N.Mex.	14,300	1,530	1,162	181	+131	.....	.....	....
9–3150	Green River at Green River, Utah ...	40,600	6,369	2,257	89	+11	.....	.....	....
11–4255	Sacramento River at Verona, Calif ...	21,257	18,370	18,800	163	+20	23,700	15,300	26
13–2690	Snake River at Weiser, Idaho	69,200	17,670	17,660	125	+4	18,900	12,200	25
13–3170	Salmon River at White Bird, Idaho ..	13,550	11,060	6,807	132	-1	6,340	4,100	26
13–3425	Clearwater River at Spalding, Idaho ..	9,570	15,320	12,480	231	+54	15,400	10,000	25
14–1057	Columbia River at The Dalles, Oreg.[5]	237,000	194,000	146,700	138	+27	.....	.....	....
14–1910	Willamette River at Salem, Oreg	7,280	23,370	33,640	121	+100	31,800	20,600	26-30
15–5155	Tanana River at Nenana, Alaska	25,600	24,040	10,400	131	-50	9,000	5,800	30
8MF005	Fraser River at Hope, British Columbia.	78,300	95,300	83,800	141	+20	58,100	37,600	28

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.
*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

SELECTED STREAM-GAGING STATIONS ON LARGE RIVERS



Location of stream-gaging stations on large rivers listed in table on page 10.

WATER RESOURCES REVIEW
NOVEMBER 1975

Based on reports from the Canadian and U.S. field offices; completed December 8, 1975

TECHNICAL STAFF

J.C. Kammerer, Editor-in-Chief
H.D. Brice, Associate Editor
T.H. Woodard R.M. Kosco
C.W. Saboe

COPY PREPARATION

L.C. Fleshmon, Chief
S.L. Peterson
D.L. Radcliffe
M.C. Olson

EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for November based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for November 1975 is compared with flow for November in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for November is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range*. In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the November flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of November. Water level in each key observation well is compared with average level for the end of November determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels*, unless described otherwise, are from the end of October to the end of November.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 metre 1 mile = 1.609 kilometres
1 acre = 0.4047 hectare = 4,047 square metres
1 square mile (sq mi) = 259 hectares = 2.59 square kilometres (sq km)
1 acre-foot (ac-ft) = 1,233 cubic metres
1 million cubic feet (mcf) = 28,320 cubic metres
1 cubic foot per second (cfs) = 0.02832 cubic metres per second = 1.699 cubic metres per minute
1 second-foot-day (cfsd) = 2,447 cubic metres per day
1 million gallons (mg) = 3,785 cubic metres = 3.785 million litres
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2.629 cubic metres per minute = 3,785 cubic metres per day

DIGITAL-SIMULATION AND PROJECTION OF WATER-LEVEL DECLINES IN BASALT AQUIFERS OF THE ODESSA-LIND AREA, EAST-CENTRAL WASHINGTON

The abstract and graph below are from the report, *Digital-simulation and projection of water-level declines in basalt aquifers of the Odessa-Lind area, east-central Washington,* by J.E. Luzier and J.A. Skrivan: U.S. Geological Survey Water-Supply Paper 2036, 48 pages, 1975; prepared in cooperation with the State of Washington Department of Ecology. The report may be purchased for $0.75 from Branch of Distribution; U.S. Geological Survey, 1200 South Eads St., Arlington, VA 22202 (check or money order payable to U.S. Geological Survey); from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (GPO Stock Number 024-001-02662-7), payable to Superintendent of Documents.

ABSTRACT

A digital computer program using finite-difference techniques simulates an intensively pumped, multi-layered basalt-aquifer system near Odessa in east-central Washington. The aquifers now developed are in the upper 1,000 feet of a regionally extensive series of southwesterly dipping basalt flows of the Columbia River Group. Most of the aquifers are confined. Those in the depth range of about 500 to 1,000 feet are the chief source of ground water pumped from irrigation wells. Transmissivity of these aquifers ranges from less than 2,700 feet squared per day to more than 40,000 feet squared per day, and storage coefficients range from 0.0015 to 0.006. Shallower aquifers are generally much less permeable, but they are a source of recharge to deeper aquifers with lower artesian heads; vertical leakage occurs along joints in the basalt and down uncased wells, which short circuit the aquifer system. For model analysis, the deeper, pumped aquifers were grouped and treated as a single layer with drawdown-dependent leakage from an overlying confining layer. Verification of the model was achieved primarily by closely matching observed pumpage-related head declines ranging from about 10 feet to more than 40 feet over the 4-year period from March 1967 to March 1971.

Projected average annual rates of decline in the Odessa-Lind area during the 14-year period from March 1967 to March 1981 are: from 1 to 9 feet per year if pumpage is maintained at the 1970 rate of 117,000 acre-feet per year (fig. 1); or, from 3 to 33 feet per year if 1970 pumpage is increased to 233,000 acre-feet per year, which includes 116,000 acre-feet per year covered by water-right applications held in abeyance. In each case, projected drawdown on the northeast side of a major ground-water barrier is about double that on the southwest side because of differences in transmissivity and storage coefficient and in sources of recharge.

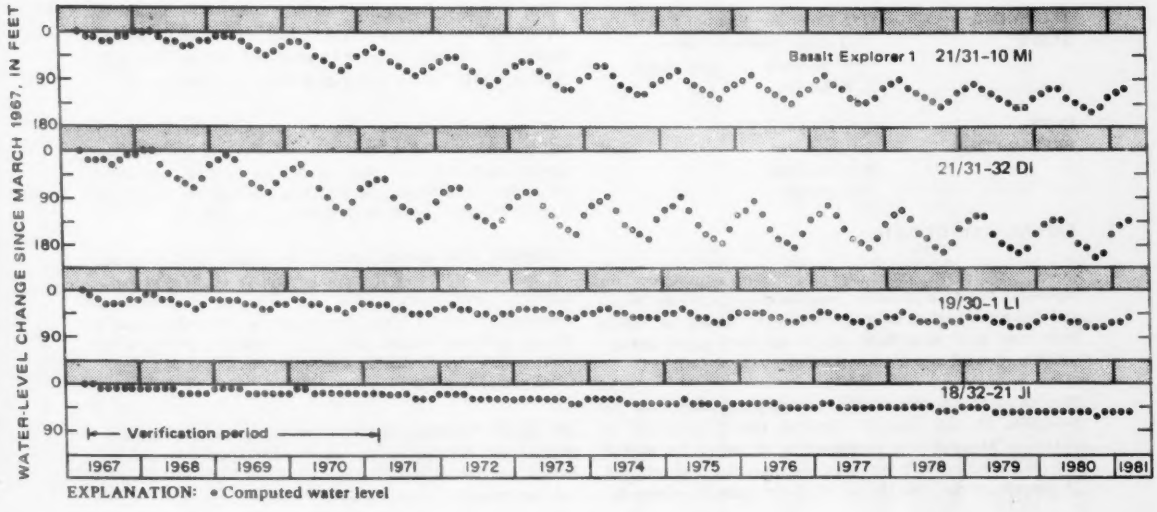


Figure 1.--Water-level trends at selected wells, projected beyond the verification period to 1981, computed with annual pumpage held at 1970 rate of 117,000 acre-feet.

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